

IN THE CLAIMS

1 1. [currently amended-previously amended] A head end apparatus for a cable
2 television operator, comprising:
3 one or more inputs for receiving streams of compressed MPEG data
4 packets and/or uncompressed Internet Protocol (P) packets encoding a plurality
5 of video programs and/or other services provided by servers coupled to said one
6 or more inputs;
7 one or more transmitters, transceivers or modems, each having an output
8 coupled to a downstream transmission medium and an input for receiving a
9 stream of packets containing data encoding one or more programs and/or
10 services and any other data to be used with said programs and/or services; and
11 a pull multiplexer coupled to receive upstream program and/or service
12 requests and to receive said one or more streams of uncompressed and/or
13 compressed data packets from said one or more inputs, and having one or more
14 data outputs at each of which is output a an output stream of data packets
15 containing data encoding one or more requested video programs and/or services
16 provided by servers coupled to said inputs, each said data output being coupled
17 to an input of one of said one or more transmitters, transceivers or modems ~~via a~~
18 ~~recoding circuit~~, said pull multiplexer including a programmed computer to map one
19 or more requested programs and/or services and/or programs or services which
20 are to be broadcast without specific requests to program identifier codes, IP
21 addresses or other identifying information that can be used by one or more culling
22 switches that are part of said pull multiplexer to cull out data packets from said
23 streams of compressed and uncompressed data packets received at said one or

24 more inputs that contain data encoding said requested program(s) and/or
25 service(s); and wherein

26 ~~and wherein each said recoding circuit comprises circuitry to receive~~
27 ~~MPEG, P and other packets culled out by said pull multiplexer and information~~
28 ~~regarding the available bandwidth on the downstream channel and to~~
29 ~~decompress the data in said packets and recompress said data to a more~~
30 ~~compressed state if necessary to meet available bandwidth in the downstream~~
31 ~~medium.~~

32 said programmed computer is further programmed to optimize the
33 assembly of said output streams of data packets to be transmitted to each
34 customer by analyzing the number of requests for programs and/or services
35 received from each customer and analyzing the number of tuners each said
36 customer has and analyzing the current availability of subchannels on one or
37 more logical channels and attempts to create said output streams of data packets
38 so that all the data packets encoding the programs and/or services each
39 particular customer requested are transmitted on subchannels on a number of
40 channels that does not exceed the number of tuners said customer has including
41 attempting to move or combine data being transmitted to other customers on other
42 available subchannels of one or more other logical channels so as to make
43 enough subchannels available on a number of logical channels equal to or less
44 than the number of tuners each particular customer has such that all data of
45 programs and/or services requested by that customer can be transmitted on a
46 number of logical channels equal to the number of tuners said customer has.

1 2. [previously cancelled]

1 3. [currently amended] The apparatus of claim 1 wherein said culling switches of
2 said pull multiplexer have outputs and are controlled ~~includes culling switch circuitry to~~
3 select data packets defining one or more output data streams for transmission on one or
4 more logical channels such that one or more subchannels carry data encoding popular
5 programs and/or services that are to be transmitted downstream in broadcast fashion
6 regardless of whether there are any current program and/or service requests for said
7 popular programs and/or services and to output said data packets defining said one or
8 more popular programs and/or services at said data output, and further comprising a
9 recoding circuit coupling said output of each said culling switches to said input of a
10 transmitter, transceiver or modem and functioning to receive MPEG, P and other packets
11 culled out by said culling switches and to decompress the data in said packets and
12 recompress said data to a more compressed state if necessary to meet available
13 bandwidth in the downstream medium.

1 4. [currently amended - previously amended] The apparatus of claim 1 wherein
2 said pull multiplexer comprises means for receiving upstream requests for video
3 programs and services from users and for controlling upstream transmissions by
4 implementing a log-in procedure to authenticate ~~authenticate~~ users so as to make sure
5 upstream requests come only from users who have valid subscriptions.

1 5. [original] The apparatus of claim 1 wherein said pull multiplexer further
2 comprises means for managing said output streams for maximum efficiency in transmitted
3 requested programs and/or services so that as many requests as possible from as many
4 customers as possible can be fulfilled.

1 6. [currently amended] The apparatus of claim 1 wherein said programmed
2 computer in said pull multiplexer is further programmed to send a downstream message
3 including data for each subscriber who has ordered a program and/or service, said
4 message including data indicating upon which logical channel and subchannels said
5 ordered program and/or service will be found. ~~further comprises means for assembling~~
6 ~~data packets that comprise said output streams such that all the data packets that~~
7 ~~encode requested programs and/or services and associated data to be viewed and/or~~
8 ~~used at any particular customer premises are transmitted to said customer on a number~~
9 ~~of logical channels equal to or less than the number of tuners said customer has.~~

1 7. [original] The apparatus of claim 1 wherein said pull multiplexer further
2 comprises a programmed microprocessor that functions to optimize the assembly of
3 output streams of data packets by analyzing the number of requests for programs and/or
4 services received from each customer and the number of tuners each said customer has
5 and the current availability of subchannels on one or more logical channels and attempts
6 to creates said output streams of data packets so that all the data packets encoding the
7 programs and/or services each particular customer requested are transmitted on
8 subchannels on a number of logical channels that does not exceed the number of tuners
9 said customer has.

8. [cancelled here]

1 9. [currently amended and previously amended] A head end for a cable TV
2 system, comprising:

3 a head end cherry picker multiplexer having a plurality of inputs for
4 coupling to data paths to receive input MPEG packet data streams from one or
5 more video servers, Internet Protocol (P) packets ~~from wide area network~~
6 ~~servers~~, and/or packets from T-carrier interface circuitry or telephone company
7 digital switches and having one or more outputs at each of which is generated an
8 output data stream, said cherry picker multiplexer including and further comprising
9 culling means for receiving upstream requests for program(s) and/or service(s)
10 received from one or more customers and mapping said upstream requests to
11 program identifier codes, P addresses or other packet identifying information and
12 for communicating said program identifier codes to said one or more video
13 servers to cause them to output requested video-on-demand program data as an
14 MPEG packet stream, said culling means using said program identifier codes, said
15 P addresses and/or said other packet identifying information to cull out packets
16 from said MPEG packet streams and/or input streams of P packets and/or said
17 packets received from T-carrier interface circuitry in one or more culling switches
18 both in response to requests from customers and in order to broadcast certain
19 "pushed" programs and/or services regardless of whether there are any
20 requests for said "pushed" programs so as to generate said one or more said
21 output data streams and wherein said cherrypicker multiplexer includes a
22 management means for analyzing upstream requests received from each
23 customer and the number of tuners each customer has and for analyzing the
24 availability of logical channels and subchannels as compared to the number of
25 components of video programs and/or other services requested by each
26 customer and controlling said culling switches in such a way to generate said
27 output data streams in such a way such that each output data stream for a

28 particular customer can be transmitted on a number of logical channels which
29 does not exceed the number of tuners said customer has, and for generating
30 management and control messages which control upon which logical channels
31 and subchannels the programs and services requested by each customer or
32 pushed programs will be transmitted and for generating messages to be sent to
33 each customer premises which indicate upon which logical channel(s) and
34 subchannels the video program(s) and/or services requested by said customer
35 will be arriving;

36 a plurality of recoders, each having an input coupled to receive one of
37 said output data streams and having an output, each said recoder for
38 decompressing the data in compressed data packets of said output data stream
39 and recompressing said data into a recompressed data stream which may include
40 P packets and packets from said T-carrier interface and having a bandwidth
41 which is less than or equal to the available bandwidth ~~on a subchannel~~ on a data
42 path to be used to to transmit said recompressed data stream to a customer, and
43 for outputting said recompressed data stream at said output;

44 a bank of one or more cable modems, each cable modem coupled to an
45 output of a said recoder to receive a recompressed data stream generated from
46 an output data data stream assembled by said cherrypicker multiplexer and
47 coupled to receive one or more said management and control messages from said
48 management means in said cherrypicker multiplexer indicating upon which
49 subchannel(s) the data packets encoding one or more program(s) and/or
50 service(s) are to be transmitted, each cable modem for modulating the packets
51 encapsulating the data of different program(s) and/or service(s) ordered by
52 particular customers or pushed program in the subchannels encoded in the data

53 packets of said recompressed data stream onto particular subchannels of
54 particular logical channels designated in one or more said management and
55 control messages received from said cherrypicker multiplexer so as to generate
56 signals bearing the requested video program(s) and/or services requested by
57 each user and pushed programs and transmitting said signals to which are
58 ~~transmitted to the cable modems of said customers~~ users via a hybrid fiber
59 coaxial cable system.

1 10. [original] The apparatus of claim 9 wherein said culling means includes a
2 microprocessor programmed to receive upstream packet data other than requests for
3 programs and/or services and route said upstream packet data to the appropriate wide
4 area network server and/or T-carrier interface circuitry or telephone company digital
5 switch.

1 11. [currently amended] The apparatus of claim 9 wherein said cable modems are
2 DOCSIS compatible. ~~further comprising bandwidth compression circuitry coupled to~~
3 ~~receive said output data streams from said culling means and alter the bandwidth if~~
4 ~~necessary in accordance with the available bandwidth on a downstream medium to~~
5 ~~which said head end cherry picker multiplexer is coupled~~

1 12. [currently amended] The apparatus of claim 9 further comprising means for
2 managing said output data streams for maximum efficiency. ~~wherein said culling means~~
3 ~~includes a programmed microprocessor and stored data indicating how many tuners~~
4 ~~each customer has to tune into requested or pushed programs and/or services, said~~
5 ~~microprocessor programmed to analyze the number of requests received from each~~

6 ~~customer and the number of tuners said customer has and the available bandwidth on a~~
7 ~~shared downstream medium coupling said head end cherry picker multiplexer to all said~~
8 ~~customers, and for performing said culling process in such a way as to transmit as many~~
9 ~~requested programs and/or services as possible to each customer on a number of logical~~
10 ~~channels that is equal to or less than the number of tuners said customer has to tune~~
11 ~~said logical channel.~~

1 13. [currently amended - previously amended] A head end multiplexer system for
2 a central office of a DSL system, comprising:
3 one or more video inputs for receiving MPEG packet streams of video data
4 from a video server;
5 one or more P inputs for receiving streams of P packets from a server,
6 router or gateway ~~coupled to a wide area network~~;
7 one or more wideband inputs for receiving telephony packets containing
8 digital data from an interface to a wide band digital network such a T-carrier
9 system or X.25 packet network;
10 one or more POTS inputs for receiving plain old telephone service analog
11 signals from a POTS switch in a public service telephone network;
12 one or more upstream inputs for receiving upstream program and/or
13 service requests and upstream data;
14 one or more culling switch means for culling out MPEG packets received at
15 said video inputs, P packets received at said P inputs and said wideband inputs
16 in accordance with culling selection criteria given to said one or more culling
17 switch means and organizing the resulting culled packets into one or more output
18 streams of packets, each output stream containing the data encoding programs

19 and/or services requested by user(s) at one customer premises;

20 control means for processing upstream program and/or service requests
21 received from users at all customer premises and for analyzing the number of
22 tuners each customer has and the number of requests each user has made and
23 the bandwidth availability on a bidirectional channel and a wideband channel of
24 said DSL line and for generating said culling selection criteria so that, as many
25 times as possible, said requested program(s) and/or service(s) are sent on a
26 number of logical channels that do not exceed the number of tuners said
27 customer has ~~generating said culling selection criteria for programs and/or~~
28 ~~services requested from each customer's premises from said upstream program~~
29 ~~and/or service requests received from that customer's premises~~, said control
30 means also for generating management and control messages for transmission to
31 each customer premises indicating which logical channel(s) and subchannel(s)
32 on the DSL line coupled to said customer premises on which the requested
33 program(s) and/or service(s) will be found, said control means also for
34 generating management and control messages for controlling which channels and
35 subchannels on which each program and/or service requested by a particular
36 customer will be transmitted on a DSL line coupling said head end multiplexer to
37 said customer premises;

38 one or more DSL modems, each having an output for coupling to a DSL
39 line coupling said head end multiplexer to one customer premises and each having
40 one or more inputs for coupling to receive one of said output data streams from
41 said culling switch means and receive management and control messages for
42 transmission to the customer premises said DSL modem is coupled to via a DSL
43 line and to receive management and control messages for use by said DSL

44 modem to control the logical channel(s) and subchannel(s) said DSL modem will
45 use in transmitting data encoding said requested program(s) and/or service(s) to
46 said customer, and each DSL modem having an input for coupling to one of said
47 POTS inputs, and each DSL modem having one or more outputs coupled to said
48 upstream inputs of said control computer, each DSL modem having circuitry for
49 transmitting data encoding one or more requested and/or pushed program(s)
50 and/or service(s) on one or more channels of said DSL line;

51 and wherein said control means includes routing circuitry including a
52 microprocessor coupled to said upstream inputs for receiving upstream data
53 packets and programmed to analyze the destination of each upstream data packet
54 and route it to a WAN gateway or server or T-carrier interface circuitry.

1 14. [currently amended] The apparatus of claim 13 further comprising means for
2 managing said output data streams for maximum efficiency. ~~wherein said control means~~
3 ~~includes means for analyzing the number of tuners each customer has and the number~~
4 ~~of requests each user has made and the bandwidth availability on a bidirectional channel~~
5 ~~and a wideband channel of said DSL line and for generating said culling selection criteria~~
6 ~~so that, as many times as possible, said requested program(s) and/or service(s) are sent~~
7 ~~on a number of logical channels that do not exceed the number of tuners said customer~~
8 ~~has.~~

1 15. [original] The apparatus of claim 13 wherein said head end cherry picker
2 multiplexer further comprises bandwidth recoders coupled to receive output data
3 streams from said culling switch means and functioning to alter the bandwidth of each
4 said output stream in accordance with instructions, and wherein said control means